APPENDIX E
Environmental Baseline Study

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Environmental Baseline Study
Miami Harbor
General Reevaluation Report

FINAL REPORT

Revised
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Prepared for
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U.S. Army Corps of Engineers
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PREFACE

This report was previously issued to the US Army Corps of Engineers Jacksonville District during May 2001 and included an assessment of impacts and a preliminary list of mitigation options that were identified based on limited site investigations and communications with local resource personnel. The information was intended solely for internal planning purposes by the Corps, and due to the preliminary nature of the project alternatives and evaluations at the time the report, it was determined that those sections regarding a discussion of impacts and mitigation should not be circulated. Any information regarding project impacts and mitigation will be included in the Environmental Impact Statement for the project once the project alternatives have been determined and appropriate mitigation has been identified. A summary of direct impacts acreages is provided for the preliminary design alternatives.

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1.0 INTRODUCTION

The Miami-Dade County Seaport Department of the Port of Miami requested the U.S. Army Corps of Engineers, Jacksonville District, to study the feasibility of modifying portions of Miami Harbor to improve the Federal navigation system of channels. Hence, Dial Cordy and Associates Inc. (DC&A) was subcontracted by Gulf Engineers and Consultants Inc. (GEC) to conduct an environmental baseline study and preliminary impact assessment for proposed deepening and widening of Miami Harbor at Miami, Florida for the U.S. Army Corps of Engineers, Jacksonville District, under contract No. DACW17-99-D-0043.

The DC&A study included conducting an environmental resource survey of the study area (Figure 1) that included field investigations (video surveys and diver surveys) to characterize marine habitats within the areas to be potentially impacted. Also, literature, data, and other information were collected, compiled, and reviewed. A summary of the findings of the DC&A study are presented in this report.

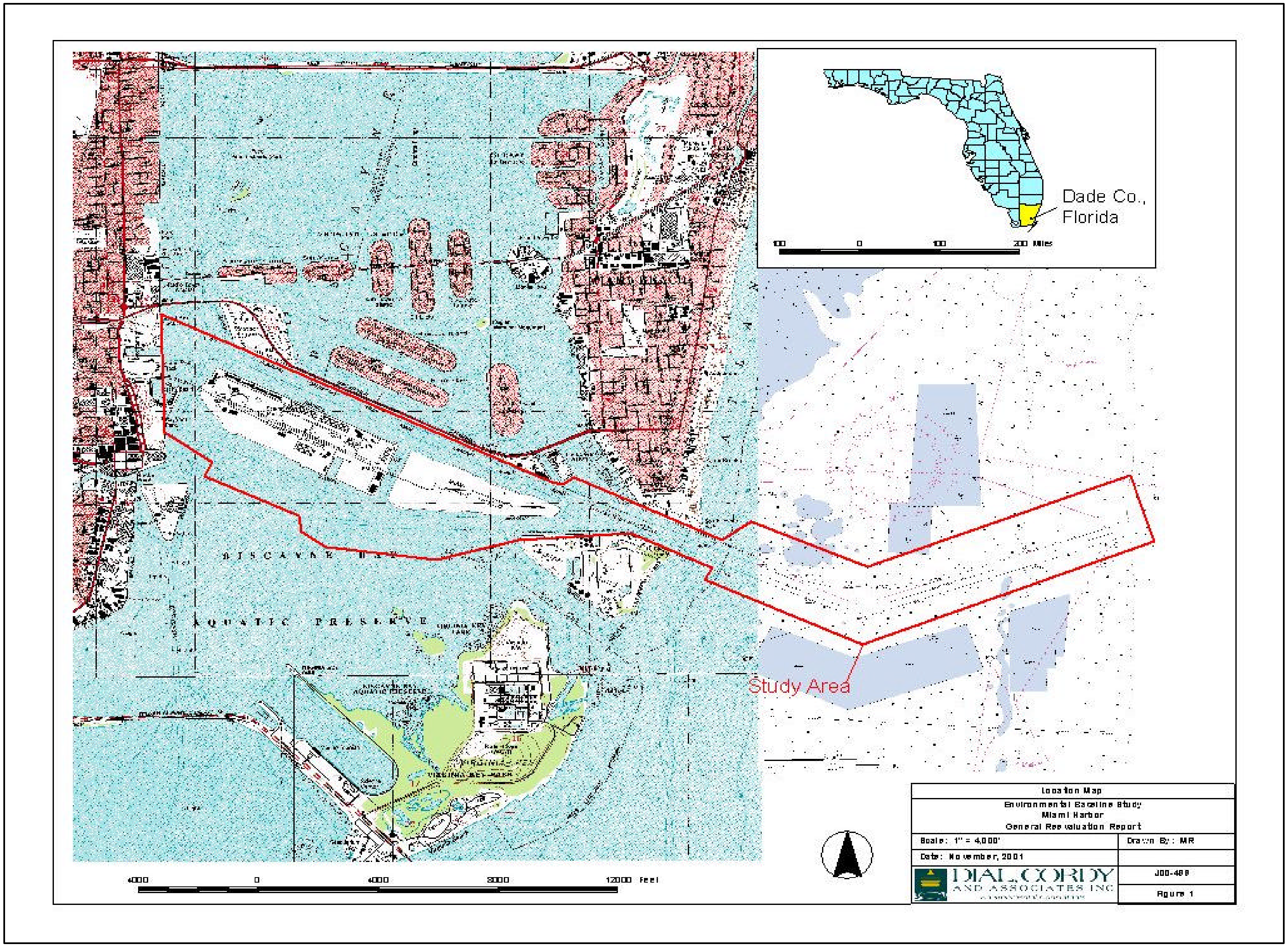
1.1 Project Description

The objective of the environmental baseline survey report was to document benthic marine habitat types in the Miami Harbor (Miami, Florida) area. These habitats included seagrass, unvegetated softbottom, rock/rubble, hardbottom, and reef communities. The field survey for this study was conducted from offshore Buoy #1 of Federal Channel through Government Cut; within and adjacent to Miami Harbor from Government Cut to the cruise ship channel turning basin; and along Fisherman's Channel to the southwest end of Dodge Island (Figure 1). The survey also included identification of protected marine plants, animals and habitats within the project area.

1.2 Background

Miami Harbor is a shallow saltwater sound at the northern end of Biscayne Bay, Florida. The Port of Miami is one of the major port complexes along the east coast of the United States. The first modifications authorized by Congress to expand the Port came in 1902 and several Acts have been authorized since to keep up with the demands of larger vessels using the Port. Many of the suggested alternative modifications for the report were discussed in the Navigation Study for Miami Harbor Channel, Feasibility Report and Environmental Impact Statement-10140 (USACE, 1989). In the interim since that document resulted in the authorization of navigation improvements to Miami Harbor, container ships using the harbor and associated waterways have continued to increase in length, width, and draft. Cruise ships have also increased in size. Currently these types of ships experience delays and increased operational costs due to the existing limitations of channel depth and width.

Figure 1   Location of Study Area



The Miami-Dade County Seaport Department provided correspondence (Appendix A) from the Biscayne Bay Pilots outlining their concerns for the need to widen certain segments of the navigation channels in addition to the need for deepening. According to the harbor pilots, several Maersk container ships have grounded off of Buoy #1 at the beginning of the entrance channel due to variable and unpredictable currents. The pilots have requested widening the entrance channel from an existing 500-foot width to an 800-foot tapered entrance. The second location of proposed widening includes an area south of Government Cut between beacons 13 and 15. That portion of the channel includes an area where ships turn from one channel into another. Strong currents at that intersection of three different channels combined with the required decreased speed of the ship make it important to have as much swinging room as possible for the ship. A third location for widening recommended by the harbor pilots includes the south part of the Lummas Island (Fisherman's) Channel. Vessels docked along Lummas Island swing their onboard cranes 90 degrees out into the channel thereby blocking a portion of the channel. Under different conditions of wind, current, ship size and draft, passing those docked vessels results in an unsafe situation. Ships at dock sometimes experience a surging effect. The pilots suggest extending the southern edge of the Lummas Island Channel 100 feet to the south. Other alternatives for channel modifications relate to requests by the Miami-Dade County Seaport Department to expand their cruise ship terminals.

The proposed navigation modifications will undergo ship simulation testing and further environmental evaluation as part of the current study process for the Miami Harbor General Reevaluation Report and Environmental Impact Statement. Further coordination will occur as the study process continues.

1.3 Proposed Modification Alternative Descriptions

Proposed preliminary modification alternatives are summarized in Figure 2. A description of the proposed modification alternatives is as follows:

No Action Plan	**Port would continue operation under the existing conditions.**
Alternative 1	Widen seaward portion of cut-1 from 500 feet to 800 feet and deepen Cut-1 and Cut-2 from existing depth of 44 feet to a depth of 52 feet.
Alternative 2	Add turn widener between Buoy #13 and Buoy #15 and deepen from existing depth of 42 feet to a depth of 50 feet.
Alternative 3	Expand Fisher Island turning basin and deepen from existing depth of 42 feet to a depth of 50 feet.
Alternative 4	Relocate the western end of the main channel to allow for additional cruise ship berths.
Alternative 5	Widen Fisherman's channel approximately 100 feet to the south and deepen from current depth of 42 feet to a depth of 50 feet. Deepening would include Cut-3, station 0+00 to Cut-3 station 42+00

Alternative 6	Deepen Dodge Island Cut and the proposed 1200-foot diameter turning basin from 32 and 34 feet to 36 feet and relocate western end of Dodge Island cut to accommodate proposed Port expansion.

Figure 2 Proposed Modification Alternatives

2.0 TECHNICAL APPROACH

The technical approach utilized to document and characterize marine seagrass, hardbottom, and coral reef communities within the study area (Figure 1) is described below. Surveys were conducted during August and September 2000, with additional seagrass mapping of the Critical Wildlife Area (CWA) in November 2000.

2.1 Seagrass Community Assessment

2.1.1 Location of Survey Transects

Survey transects within the study area included the area 400 feet south of Fisherman's Channel, including the area within the CWA, the area adjacent to the Coast Guard Station, the Entrance Channel, and the area 500 feet north and south of the offshore channel (Figure 3).

2.1.2 Seagrass Mapping

Marine seagrass was mapped along 35 transects within the designated project study area by locating the end positions of the transects using Differential Global Positioning System (DGPS), laying a weighted line marked in one meter increments from the shore, and then conducting a visual diver survey along the weighted line to document seagrass distribution and occurrence from the shore to the edge of channel. Seagrass habitat and bottom type observed while crossing each transect were noted. Divers drift dove to the next transect, and if any seagrass was found between transects, a DGPS position at the start and end of the grass bed was recorded and the width of the grass bed estimated. Information recorded on seagrass habitat type and distribution was transferred from field logs and entered into a spreadsheet. Table 1 lists a description of habitat classifications used for mapping purposes. This approach allowed a visual representation of species' associations and occurrences across the shelf, channel, and slope as compared with bottom depth. Maps were produced for all stations surveyed that had seagrass present. A GIS map (ArcView) and database were created to illustrate seagrass distribution throughout the study area.

2.1.3 Seagrass Occurrence, Abundance and Density

To obtain biological data regarding the location, occurrence, abundance, and density of marine seagrass, a SCUBA point intercept survey was performed along each transect. For each transect, the average percent (percent of sixteen 25 x 25 cm sub-units within a $1m^2$ quadrat that contains at least one seagrass shoot) was estimated in $1m^2$ quadrats at 10m intervals along

Figure 3 Seagrass and Hardbottom/Reef Habitat Assessment Transects

Table 1 Habitat Classification System Used for Mapping of Seagrass Species

Habitat Types	Description
Halophila decipiens	Monospecific bed of this species
Halophila johnsonii	Monospecific bed of this species
Halodule wrightii	Monospecific bed of this species
Syringodium filiforme	Monospecific bed of this species
Mixed Submerged Aquatic Vegetation	*S. filiforme or H. wrightii* with *H. decipiens*
Mixed Submerged Aquatic Vegetation with *H. johnsonii*	*S. filiforme* and or *H. wrightii* with *H. johnsonii*
Mixed Submerged Aquatic Vegetation with *H. johnsonii* and *H. decipiens*	*H. wrightii* with both species of *Halophila*
Unvegetated Bottom	Sand, silt or shell substrate with no seagrass or live bottom, may have marine algae present
Live-Bottom Habitat	Sponge and soft coral community over thin veneer of silty-sand

the transect line (Virnstein 1995; Fonseca et al. 1998; Braun-Blanquet 1965). Specific data recorded within each $1m^2$ quadrat for each seagrass species present included the number of sub-units containing at least one shoot, an average cover abundance score (Braun-Blanquet 1965), a description of substrate type, and any other observations considered useful. The cover abundance scale is shown below.

Cover abundance was measured at 10m intervals beginning along each transect. The content of each quadrat was visually inspected and a cover-abundance scale value assigned to the seagrass coverage.

The scale values are:

0.1 = Solitary shoots with small cover
0.5 = Few shoots with small cover
1.0 = Numerous shoots but less than 5% cover
2.0 = Any number of shoots but with 5-25% cover
3.0 = Any number of shoots but with 25-50% cover
4.0 = Any number of shoots but with 50-75% cover
5.0 = Any number of shoots but with >75% cover

From the survey of quadrats along each transect, frequency of occurrence, abundance, and density of seagrass was computed as follows:

Frequency of occurrence = Number of occupied sub-units/total number of sub-units
Abundance = Sum of cover scale values/number of occupied quadrats
Density = Sum of cover scale values/total number of quadrats

2.1.4 Analysis and Interpretation of Seagrass Data

Distribution of seagrass community types were mapped for each transect from data collected in the field, as the potential for occurrence in an area. Frequency of occurrence, abundance, and density were calculated from the quadrat data based on Braun-Blanquet (1965) methodology.

2.2 Hardbottom and Reef Habitat Assessment

A reef and live-hardbottom assessment was conducted in the area offshore from the jetty in the federal channel to 15,000 feet offshore to verify existing resource maps and to characterize the marine resources in the study area. To verify the accuracy of existing reef and hardbottom maps (e.g., those of Continental Shelf Associates, 1993), towed underwater video (J.W. Fishers TOV-1™) in conjunction with DGPS was used to record and mark the occurrence of hardbottom and reef habitats along transects on each side of the entrance channel (Figure 3). Side-scan sonar imaging (Klein 590^{TM}) was also utilized to map the hardbottom and reef habitat features offshore. Side-scan, video and field data collected was used to assess the accuracy of existing maps of coral reef and nearshore hardbottom habitats within the study area. A revised resource map was prepared based on remote surveys conducted and existing resource maps.

2.2.1 Habitat Characterization and Mapping

To illustrate the occurrence of reef and hardbottom habitats within the study area, existing resource maps of the area were compared to video and side-scan data. The classification system utilized for mapping is described in Table 2. Following compilation of habitat distribution in reef and hardbottom communities, data were transferred into a database for use in mapping using ArcView (GIS). A visual representation of habitat types was constructed using these data and existing maps for the Port area.

2.2.2 Visual Fish Survey

A visual survey of fishes found within Miami Harbor hardbottom communities was performed. Reef and hardbottom communities were chosen from stations where DGPS coordinates were taken in conjunction with towed video documentation of reef or hardbottom sighted. On reef and hardbottom areas, divers were deployed along a 50m transect. All dominant fish species observed were recorded and relative abundance gauged. Species lists were then compiled using existing reports and data collected.

2.2.3 Photodocumentation

Both video and still photos were used to document fish species present along fish survey transects. Video was recorded along each side of the 50m transect to document marine life. Still photographs were taken every 2m along the transect length.

2.3 Essential Fish Habitat Identification

The comprehensive Fishery Management Plan prepared by the South Atlantic Fishery Management Council (SAFMC 1998b) establishes mangrove, seagrass, nearshore, and offshore reefs as essential fish habitat for coral, coral reefs, live-bottom habitat, snapper-grouper complex, red drum, penaeid shrimp, and coastal migratory pelagics. Furthermore, the plan establishes Essential Fish Habitat-Habitat Areas of Particular Concern (EFH-HAPC) within these areas for the spiny lobster

(*Panulirus argus*), Snapper-Grouper complex, and penaeid shrimp. Areas meeting the criteria of the management plan were identified within the study area and noted during the study.

Table 2 Classification System Used for Mapping of Hardbottom and Reef Habitats

Habitat Type	Description
Low -Relief Reef	Low profile stony coral, sponge, and gorgonian community
High-Relief Reef	High profile stony coral, sponge and gorgonian community
Patchy Low-Relief Reef	Isolated low profile stony coral, sponge, and gorgonian community
Patchy High-Relief Reef	Isolated high profile stony coral, sponge and gorgonian community
Scattered Rock/Algae/Sponge Community in Sand	Carbonate rock covered with algae, sponge or algae and sponge in sand
Sand	Softbottom habitats composed primarily of sand/sand with algae layer
Underlying Nearshore Bedrock with Sand	Oolitic limestone layer covered with fine layer of sand

3.0 ENVIRONMENTAL BASELINE

This section includes a description and review of the results of the marine resources survey. It outlines the findings of the seagrass community survey, including species occurrence, abundance, and density. It also addresses reef and hardbottom community distribution, species profiles, the presence of EFH, and occurrence records of protected marine plants and mammals. A summary of field data is located in Appendix B, while a list of persons contacted and pertinent correspondence is contained in Appendix A.

3.1 Seagrass Communities

Seagrass habitat cover type, abundance, and density for the study area are described below. Distribution and occurrence observations range from approximately 400 feet south of Fisherman's Channel, including the area of the CWA, and the area adjacent to the Coast Guard Station north of the entrance channel at the southern tip of Miami Beach (Figure 4).

3.1.1 Quantitative Measures

Marine seagrass species observed within the study area included *Halodule wrightii, Halophila decipiens*, *Syringodium filiforme* and *Thalassia testudinum.* Of the 35 transects surveyed (Figure 3), marine seagrass species were observed at 25 transects. A summary of occurrence records for each transect where seagrass is found in Table 3. Seagrass occurrence in these areas consisted of mixed Submerged Aquatic Vegetation (SAV) with *H. decipiens* and *H. wrightii*, mixed SAV with *H. wrightii, and T. testudinum,* mixed SAV of *T. testudinum and S. filiforme,* mixed beds of all species and, monospecific beds of *T. testudinum*, and monospecific beds of *H. decipiens*. No *H. johnsonii* was observed while surveying the 35 transects.

<u>Frequency of Occurrence</u>. *S. filiforme* had a range of occurrence values between 0 to 82 percent with a mean of 36 percent over the study area. *H. wrightii* occurred within 16 of the 35 transects sampled. Frequency of occurrence values ranged from 0 to 52 percent with a mean of 29 percent. *H. decipiens* occurred within 7 transects sampled. Frequency of occurrence for *H. decipiens* values ranged between 0 to 38 percent with a mean of 15 percent. In comparison, *T. testudinum* occurred within 15 transects surveyed, with a range of 0 to 50 percent and a mean of 19 percent.

Figure 4   Seagrass Distribution

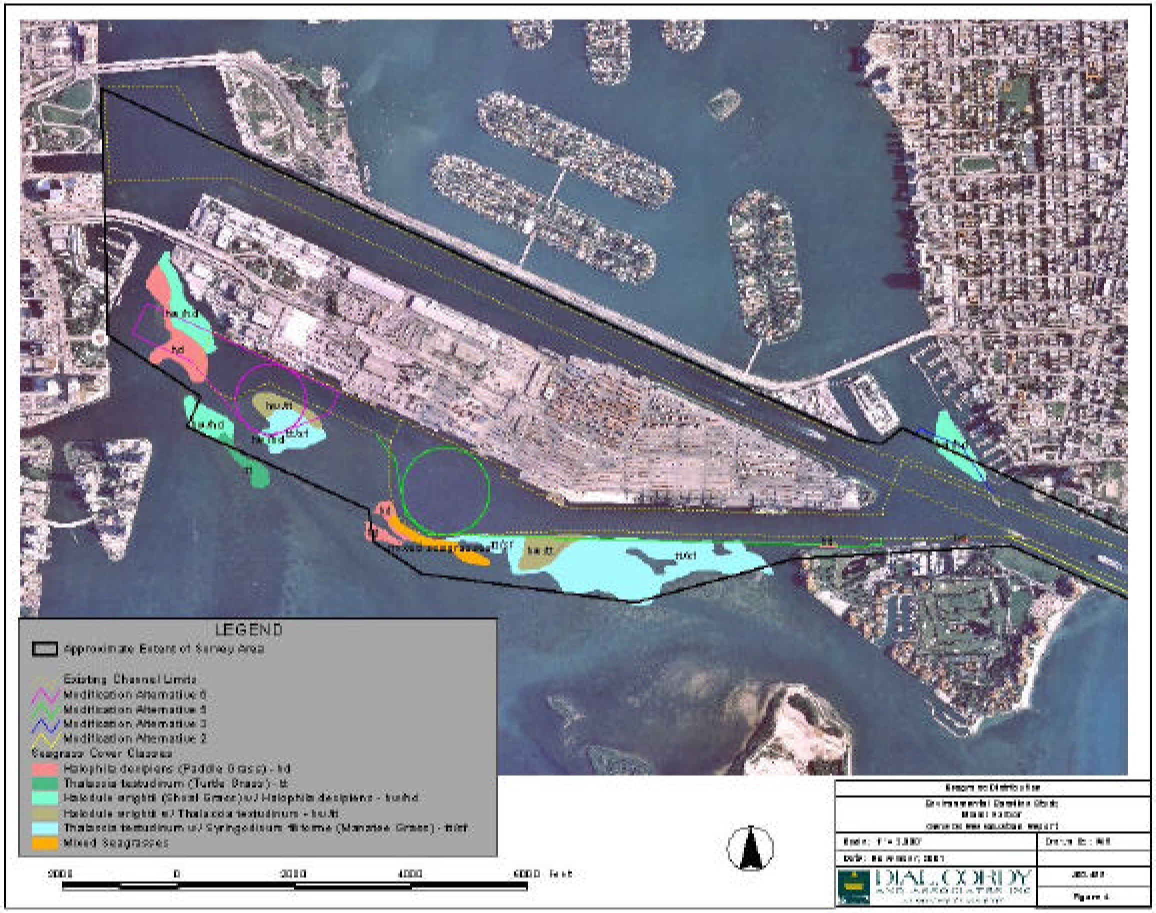


Table 3 Seagrass Frequency of Occurrence, Abundance, and Density Values for Miami Harbor Survey Transects

	Halodule wrightii	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*	*Halodule wrightii*	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*	*Halodule wrightii*	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*
Transect	**Frequency of Occurrence**				**Abundance**				**Density**			
F4	-*	-	-	-	-	-	-	-	-	-	-	-
F5	-	-	0.1000	0.6000	-	-	4.0000	3.0000	-	-	0.8000	1.8000
F6	-	-	0.2500	0.5000	-	-	3.0000	3.5000	-	-	0.2500	0.5000
F7	-	-	0.2500	0.2969	-	-	2.0000	3.0000	-	-	0.5000	1.5000
F8	-	-	0.1667	0.5417	-	-	2.0000	3.7500	-	-	0.3333	2.5000
F9	-	-	0.4000	0.5250	-	-	3.5000	2.5250	-	-	1.4000	2.0200
F10	-	-	0.5000	0.2500	-	-	2.6667	3.0000	-	-	2.0000	0.7500
F11	-	0.1000	-	-	-	0.7500	-	-	-	0.3000	-	-
F12	0.1750	0.0500	0.2500	0.0500	3.0000	1.0000	1.5000	0.5000	0.6000	0.2000	0.6000	0.1000
F13	0.0625	-	0.0625	-	1.0000	-	1.0000	-	0.2500	-	0.2500	-
F14	-	-	-	0.3375	-	-	-	3.5000	-	-	-	1.4000
F15	0.5250	-	-	0.3375	4.3333	-	-	3.5000	2.6000	-	-	1.4000
F16	-	-	0.0625	0.5000	-	-	1.2500	3.5000	-	-	0.6250	1.7500
F17	-	-	-	-	-	-	-	-	-	-	-	-
B1	0.1667	0.1667	-	-	4.0000	4.0000	-	-	0.6670	0.6670	-	-
B2	0.2000	-	0.3000	-	5.0000	-	3.0000	-	1.0000	-	1.2000	-
B3	0.2000	0.2875	-	0.0063	4.0000	2.8000	-	0.0100	0.8000	1.4000	-	0.0100
B4	0.2153	0.3472	0.0833	-	2.1250	2.5000	3.0000	-	0.9444	1.3889	0.3333	-
B5	0.0179	0.3839	-	-	0.5000	2.1000	-	-	0.0714	1.5000	-	-
B6	-	-	-	-	-	-	-	-	-	-	-	-
B7	0.1339	-	-	0.2857	4.0000		-	5.0000	0.5714	-	-	1.4286
B8	-	-	-	-	-	-	-	-	-	-	-	-
B9	-	-	-	-	-	-	-	-	-	-	-	-
B10	-	-	-	-	-	-	-	-	-	-	-	-

Transect	Frequency of Occurrence				Abundance				Density			
	Halodule wrightii	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*	*Halodule wrightii*	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*	*Halodule wrightii*	*Halophila decipiens*	*Thalassia testudinum*	*Syrigonium filiforme*
MB1	0.3889	-	-	-	3.5000		-	-	2.3330	-	-	-
MB2	-	-	-	-	-	-	-	-	-	-	-	-
MB3	0.0568	0.0682	-	-	1.5500	3.0000	-	-	0.2818	0.2727	-	-
MB4	-	-	-	-	-	-	-	-	-	-	-	-
1A	0.2727	-	-	-	1.6250	-	-	-	0.5909	-	-	-
2A	-	-	-	-	-	-	-	-	-	-	-	-
3A	-	-	-	-	-	-	-	-	-	-	-	-
4A	0.2768	-	-	-	2.0000	-	-	-	0.5714	-	-	-
6A	0.0313	-	0.1719	0.3125	0.5000	-	3.0000	2.1250	0.0625	-	0.7500	1.0625
7A	0.2500	-	0.0179	0.8214	3.0000	-	0.5000	3.8333	0.8571	-	0.1429	3.2870
8A	0.1042	-	0.2639	0.5278	0.6667	-	2.8333	3.0000	0.2222	-	0.9444	1.6667

*= not detected

Note: Transects initially labeled F1, F2, F3, and 5A were determined to be outside of the study area and, therefore, were not surveyed.

Abundance. Abundance is expressed as a sum of the cover abundance scores divided by the number of quadrats where the specific species was assigned a score. Scores range from 0 to 5, where 1.0 is <5 percent cover, 2.0 is 5 to 25 percent cover, 4.0 is 50 to 75 percent cover, and 5.0 is >75 percent cover.

S. filiforme had the highest mean abundance within the study area (2.82). The range of abundance values ranged from 0 to 5 at the 14 transects where *S. filiforme* occurred. *H. wrightii* abundance values ranged from 0 to 5 over transects sampled with a mean of 2.67. *T. testudinum* occurred within 15 transects and had a mean abundance of 2.5, while *H. decipiens* had the lowest abundance values in the survey area with a mean value of 2.24 and a range of 0 to 4.

Density. Density is expressed as the sum of the cover abundance scores divided by the total quadrats sampled. When compared to abundance values, density values are very low compared to abundance because values are averaged across all quadrats within each transect, rather than only at occupied quadrats.

Across all transects sampled *S. filiforme* had the highest density (1.41). Density values for *S. filiforme* ranged from 0 to 3.27. In comparison, *H. wrightii* had density values ranging from 0 to 2.6 with a mean of 1.14. *T. testudinum* and *H. decipiens* both had relatively low density values (0.74 and 0.59).

3.1.2 Flora and Fauna Associated with Seagrasses

Seagrass communities provide important habitat for many different species of flora and fauna. *Caulerpa prolifera* was observed in video transects of *H. wrightii*, and algae of the genera *Halimeda*, *Udotea*, and *Penicillus* have also been listed as associates of seagrasses in southeastern Florida (Zieman, 1982). Many invertebrate species also utilize seagrass communities. The most obvious inhabitants include the queen conch (*Strombus gigas*), urchins including the long spine urchin (*Diadema antillarum*), nudibranchs, bivalve mollusks, and crustaceans including the spiny lobster (*Panulirus argus*), and the blue crab (*Callinectes sapidus*). In some shallow seagrass areas, various soft corals and sponges were observed scattered within and adjacent to seagrass beds (see species listed in Section 3.2). Many fish species have also been shown to have life cycles dependent on seagrass beds. Of particular importance are the mullet (*Mugil cephalus*), snook (*Centropomis undecimalis*), and many prey species including mojarras and pinfish. Seagrass beds are also important nurseries for many of the fish associated with SAFMS Snapper-Grouper Complex (SAFMC 1998b).

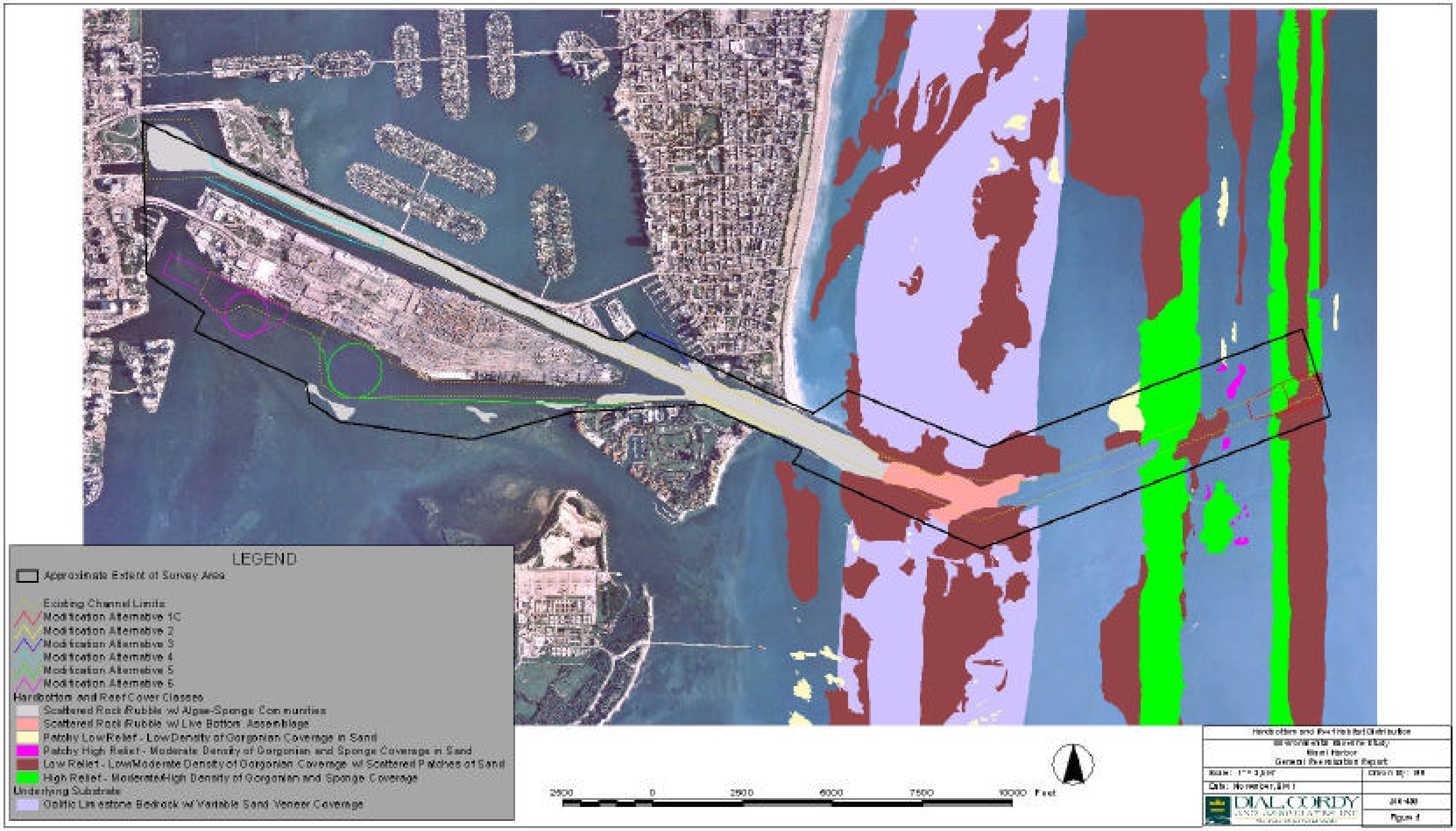
3.2 Hardbottom and Reef Communities

Hardgrounds associated with the project area include a nearshore hardbottom area and three additional parallel reef tracts that run generally north/south (Figure 5). The hardbottom zone nearest to shore exists in a physically stressed environment, and involves the Miami Oolite Formation (Hoffmeister et al., 1967). Offshore from this nearshore hardbottom area, there are three parallel reef tracts (Duane and Meisburger, 1969). The first reef occurs approximately 100 to 2000 feet from shore, the second reef is located 3,000 to 6,000 feet offshore, and the third reef is approximately 8,000 feet or more offshore. There is an extensive sand area located between the second and third reef lines. The area between the first and second reef lines is characterized by small isolated hermatypic coral heads and interspersed coral rubble, with areas of open sand (see Appendix C for additional side scan data). Resources found within the Main Channel included scattered low- and high-relief reef, with its characteristic biota, but largely comprised softbottom and rock/rubble habitat. The areas of scattered rock/rubble within the channel do exhibit some sponge and coral growth, although, this habitat is not of the same quality as areas of hardbottom outside of the channel. The channel hardbottom is rock/rubble exposed from prior dredging events, and was colonized after previous dredging activities.

3.2.1 Dominant Biota of Hardbottom/Reef Habitats

Live hardbottom and coral reef communities in the offshore areas of the study area are predictably speciose and have been characterized several times (see Seaman, 1985; Blair and Flynn, 1989; and USACE 1989). The dominant feature of the reefs and hardgrounds (low- and high-relief habitats) off Miami-Dade County is the high density and diversity of gorgonian corals (USACE, 1989 and 1996a). Observed gorgonians during this survey were primarily of the genera *Eunicea* (e.g., *E. palmeri), Plexaura* (e.g., *P. homomalla)*, and *Pseudopterogorgia*. Other observed genera included *Gorgonia*, *Plexaurella* (possibly *P. dichotoma)*, and *Pterogorgia* (possibly *P. citrina* and *P. anceps),* and possibly *Pseudoplexaura*. Hard coral species also make up a significant part of the reef assemblages in this area. They include *Porites asteroides*, *Diploria clivosa*, *Siderastrea siderea*, and *Montastrea cavernosa* (Blair and Flynn, 1989). All four of these dominant species, and a fifth, *Montastrea annularis*, were observed during the 2000 survey. Sponges observed within the project area's hardgrounds and reefs during the survey included *Ircinia campana*, *Callyspongia vaginalis*, *Cliona* sp., *Iotrochota* sp. (possibly *I. birotulata*), Geodia spp. (possibly *G. gibberosa* and *G. neptuni*) and possibly *Amphimedon compresa*. The biota of the three outer reef tracts are consistent with the overall assemblage of stony corals, sponges, and gorgonians found offshore of Miami-Dade, Broward, and Palm Beach Counties (USACE 2000). (Photographs of reef transects are shown in Appendix D.) Colonizing taxa such as sponges and certain gorgonians were more prevalent in the channel's hardbottom areas then were hard corals. Observed algal species in both channel and offshore areas included *Caulerpa* spp., *Laurencia* spp., *Cladophora* spp., and *Halimeda* spp. Flynn, et al. (1991) noted the additional presence of *Dictyota* spp. and *Jania* spp. in the area.

Figure 5 Hardbottom and Reef Habitat Distribution



3.2.2 Fishes Associated with Hardbottom/Reef Habitats

A total of 28 species of fish were observed on the offshore reef sites. A summary of the species observed is shown in Table 4. The most abundant species encountered were cocoa damselfish (*Pomacentrus variabilis*), bicolor damselfish (*Pomacentrus partitus)*, barjack (*Caranx ruber*), and bluehead wrasse (*Thalasomma bifasciatum*). Many other fishes were commonly or occasionally encountered within the study area. These included members of the families Chaetodontidae (butterflyfishes), Acanthuridae (surgeonfishes), Scaridae (parrotfishes), Labridae (wrasses), Haemulidae (grunts), Lutjanidae (snappers), and Pomacanthidae (angelfishes). Other species encountered in lesser numbers included hogfish (*Lachnolaimus maximus*), rock hind (*Epinephelus adsecnsionis*), and Spanish hogfish (*Bodianus rufus*). These results are similar to fish species observed by Bohnsack et al. (1992; 1999).

3.3 Unvegetated Softbottom Communities

Off of Miami-Dade County, softbottom habitats fall between the second and third reef lines within the study area and hence may provide a corridor for reef species to travel between reef lines and also be an important foraging area for some fish species (Jones, et al., 1991). Other unvegetated softbottom habitats are located between scattered reef patches and rock/rubble habitats both within and adjacent to the channel and between seagrass beds that occur outside the channel.

During the summer months, the most abundant algal species on unvegetated sand substrates in the project area belong to the green algae genera *Caulerpa*, *Halimeda*, and *Codium* (USACE, 1989 and 1996b). The former two taxa were observed during summer 2000 surveys. In winter months, brown algae (*Dictyota* spp. and *Sargassum* spp.) dominate (USACE, 1989 and 1996b). In addition, several species of sponges (e.g., *I. campana*, *C. vaginalis,* and *Iotrochota sp.*) and gorgonians (e.g., *Eunicia* spp. and *Gorgonia* sp.) were observed during transects through softbottom habitats. Individual colonies of algae, soft corals, and sponges that occasionally occur in these areas where little structure is available may serve to provide temporary refugia for small, motile species. Invertebrate fauna utilizing softbottom areas include the Florida fighting conch (*Strombus alatus*), milk conch (*Strombus costatus*), king helmet (*Cassia tuberosa*), and the queen helmet (*Cassia madagascariensis*) (USACE, 1996b).

The most ubiquitous infauna of inshore softbottom communities include polychaete and sipunculan worms, oligochaetes, platyhelminthes, nemerteans, mollusks, and peracarid crustaceans. Compared to shallow sand flats, seagrass communities, and areas adjacent to reef tracts, the deeper, dredged areas of the channel and harbor likely supports a less diverse infaunal species assemblage.

Table 4 Relative Abundance of Fish Species Observed During Visual Survey Miami Harbor, Florida

Common Name	Scientific Name	South Transects	North Transects
Bluehead Wrasse	*Thalassoma bifasciatum*	*A*	*C*
Slippery Dick	*Halichores bivittatus*	*C*	*C*
Cocoa Damselfish	*Pomacentrus variabilis*	*A*	*A*
Beaugregory	*Pomacentrus partitus*	*A*	*A*
Bar Jack	*Caranx ruber*	*A*	--
Princess parrotfish	*Scarus guacamaia*	*O*	*O*
Rainbow parrotfish	*Scarus guacamaia*	*O*	*O*
Stoplight parrotfish	*Sparisoma viride*	*O*	*O*
Ocean surgeon	*Acanthurus bahianus*	-	*C*
French Angelfish	*Pomacanthus paru*	*O*	*O*
Grey Angelfish	*Pomacanthus arcuatus*	*O*	*-O*
Townsend Angelfish	*Holocanthus sp.*	*R*	-
Rock Beauty	*Holocanthus tricolor*	-	*C*
Reef Butterflyfish	*Chaetodon sedentarius*	*C*	*C*
Foureye Butterflyfish	*Chaetodon capistratus*	*C*	*C*
Porkfish	*Anisotremus virginicus*	*C*	*C*
Pigfish	*Orthoprisits chysoptera*	*C*	*C*
Tomtate	*Haemulon aurolineatum*	*C*	*C*
Gray Snapper	*Lutjanus griseus*	*O*	*C*
Hogfish	*Lachnolaimus maximus*	*O*	*O*
Bluestripe Grunt	*Haemulon sciurus*	-	*C*
Yellowtail Snapper	*Ocyurus chysurus*	*C*	*C*
Redlip Blenny	*Opioblennius atlanticus*	*O*	*O*
Seaweed Blenny	*Parablennius marmoreus*	*O*	*O*
Spotted Scorpionfish	*Scorpaena plumieri*	*O*	*O*
Pearly Razorfish	*Hemipteronotus novacula*	-	*O*
Spanish Hogfish	*Bodianus rufus*	-	*R*

3.4 Rock/Rubble Communities

Within the project area there are both naturally occurring rock outcrops and rubble material that has been left from prior dredging events. The most obvious biological features of most of the rock/rubble-based habitats are resident sponges and macroalgae, whereas the remainder of the rock/rubble habitats serves as raw material for reef-building species. The latter case was apparent in the channel zone adjacent to the existing reef tracts. Observed sponge species included *Ircinia campana*, *Callyspongia vaginalis*, and *Iotrochota* sp. (possibly *I. birotulata*). Observed soft corals were similar to those of adjacent reefs, and included the genera *Eunicea Plexaura* and *Pseudopterogorgia*. Habitats provided by rock and rubble and associated sponges, algae, and soft corals provide significant refugia many species of juvenile fish species.

3.5 Essential Fish Habitat (EFH)

The SAFMC (1998a, 1998b) has designated that mangrove, seagrass, nearshore hardbottom, and offshore reef areas within the study area as EFH (Table 5). The nearshore bottom and offshore reef habitats of southeastern Florida have also been designated as EFH-HAPC (SAFMC 1998a, 1998b). Managed species that commonly inhabit the study area include penaid shrimp and spiny lobster (*Panulirus argus*). These shellfish utilize both the inshore and offshore habitats within the study area. Life stage utilization of these and other managed species are shown in Tables 6, 7, and 8.

Members of the 73 species Snapper-Grouper Complex that commonly use the inshore habitats for part of their life cycle include blue stripe grunts (*Haemulon sciurus*), French grunts (*Haemulon flavolineatum*), mahogany snapper (*Lutjanus mahogoni*), yellowtail snapper (*Ocyurus chysurus*), and Nassau grouper (*Epinephelus striatus*). These species utilize the inshore habitats as juveniles and sub-adults. As adults, they utilize the hardbottom and reef communities offshore Table 6. In the offshore habitats, the number of species within the Snapper-Grouper Complex that may be encountered increases. Other species of the Snapper-Grouper Complex commonly seen offshore in the study area include gray triggerfish (*Balistes capriscus*) and hogfish (*Lachnolaimus maximus*). Coastal migratory pelagic species also commonly utilize the offshore area adjacent to the study area. In particular, the king mackerel (*Scomberomorus cavalla*), and the Spanish mackerel (*Scomberomorus maculatus*) are the most common. As many as 60 corals can occur off the coast of Florida and all of these fall under the protection of the South Atlantic Fishery Management Plan (SAFMC 1998a).

Table 5 Essential Fish Habitat Areas in South Florida

Estuarine Areas (Fisher Island, Main Channel, Inner Entrance Channel)	Seagrass
	Estuarine Water Column
Marine Areas (Outer Entrance Channel, Nearshore and Offshore areas)	Live/Hard Bottom
	Coral and Coral Reef
	Artificial Reefs
	Water Column

Source: South Atlantic Fisheries Management Council, 1998

Table 6 Habitat Associations of Selected EFH Managed Species

DRAFT 1/30/98		Habitat Associations																																					
		Domain																								Substrate preference									Depth preference				
		Freshwate			Estuarine																			Marine											Littora		Sublittoral		
								Salinity range								Temperature range																							
								NEI			Venice system																												
Species	Life stage	Lacustrine	Riverine-coastal plain	Riverine-inland	Inlet mouth	Channel	Inter-and subtidal flats	Tidal fresh (0-0.5%)	Mixing (0.5-25%)	Seawater (>25%)	Limnetic (0-0.5%)	Oligohaline (0.5-5%)	Mesohaline (5-18%)	Polyhaline (18-30%)	Euhaline (>30%)	0-5°C	5-10°C	11-15°C	16-20°C	21-25°C	26-30°C	>30°C	Beach/surf	Neritic	Oceanic	Mud/silt/clay	Sand	Pebble/cobble/gravel	Boulder/rocky outcrop	Shell	Submergent vegetation	Emergent vegetation	Floating vegetation	None	Intertidal	Subtidal	Inner shelf (10-50 m)	Middle shelf (50-100 m)	Outer shelf (100-200 m)
Brown shrimp	A				●				●	●		●	●	●	●	●	●	●	●	●	●	●		●		●	●										●	●	
Penaeus	S									●					●				●	●	●			●		●	●											●	
aztecus	J				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●					●	●			●	●			
	L					●			●	●				●	●			●	●	●	●	●		●		●					●			●			●	●	
	E									●					●						●	●		●										●				●	
Pink shrimp	A				●	●	●			●				●	●		●	●	●	●	●	●		●		●	●			●						●	●	●	
Penaeus	S									●					●				●	●	●	●		●		●	●			●						●	●		
duorarum	J						●		●	●		●	●	●	●	●	●	●	●	●	●	●				●	●			●	●	●	●		●	●	●		
	L									●					●					●	●			●	●									●		●	●		
	E									●					●					●	●	●		●	●									●		●	●		
White shrimp	A					●			●	●		●	●	●	●		●	●	●	●	●	●		●		●	●						●				●		
Penaeus	S									●					●				●	●	●			●		●	●										●		
setiferus	J					●	●		●	●		●	●	●	●		●	●	●	●	●	●				●	●				●	●	●		●	●			
	L									●					●			●	●	●	●			●							●			●			●		
	E									●					●				●	●	●			●										●			●		
Cobia	A									●				●	●					●	●	●		●	●									●			●		
Rachycentron	S																				●	●		●										●			●		
canadum	J								●	●				●	●					●	●	●	●	●	●		●									●	●		
	L									●				●	●						●	●		●										●			●		
	E																				●	●		●										●			●		
Gray snapper	A		●		●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●		●		●	●	●	●	●	●		●			●	●		
Lutjanus	S									●					●					●	●			●					●	●						●	●		
griseus	J		●		●	●	●	●	●	●	●	●	●	●	●				●	●	●	●		●		●	●		●	●	●		●			●	●		
	L								●	●		●	●	●					●	●	●			●		●					●		●			●	●		
	E									●				●	●					●	●			●					●	●						●	●		
Red drum	A				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●						●	●	●	
Sciaenops	S																			●				●										●		●	●		
ocellatus	J				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●		●		●	●			
	L						●	●	●	●	●	●	●	●	●				●	●	●	●		●		●	●				●		●	●	●	●			
	E						●		●	●				●	●					●	●			●										●		●	●		
Spanish mackerel	A				●					●				●	●					●	●	●		●										●		●	●		
Scomberomorus	S																			●	●	●		●			●										●		
maculatus	J				●	●	●		●	●		●	●	●	●			●	●	●	●	●	●	●										●		●	●		
	L																		●	●	●			●										●		●	●		
	E																			●	●	●		●										●			●		

Source: NOAA Biogeography Program Http://biogeo.noaa.nos.gov/

Table 7 Biological Attributes Table for Selected EFH Managed Species

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		Biological Attributes																														Value			
		Life Mode					Spatial Strategy					Mobility			Feedir		Prey Items										Longevity									
Species / life stage		Epibenthic	Benthic	Demersal	Nektonic	Planktonic	Freshwater resident	Estuarine resident	Marine resident	Coastal migrant	Ocean migrant	Nonmobile	Low mobility	High mobility	Filter feeder	Non-filter feeder	Detritus	Phytoplankton	Zooplankton	Infauna	Epibenthos	Insects	Fish (eggs, larvae)	Fish (juveniles, adults)	Macroalgae	Vascular plants	1 day	1-30 days	1-12 months	1-5 years	5-20 years	>20 years	Recreational	Commercial	Ecological	Indicator of stress
Brown shrimp *Penaeus aztecus*	A			●					●					●		●	●			●	●				●					●			●	●	●	
	S			●					●																											
	J			●				●						●		●	●		●	●	●		●		●				●				●	●	●	
	L					●		●	●				●			●		●	●									●								
	E			●					●			●															●									
Pink shrimp *Penaeus duorarum*	A			●				●	●					●		●	●			●	●				●					●			●	●	●	
	S			●					●																											
	J			●				●						●		●	●		●	●	●				●				●					●	●	
	L					●		●	●				●			●		●	●				●					●								
	E			●					●			●															●									
White shrimp *Penaeus setiferus*	A			●				●	●					●		●	●			●	●				●	●				●			●	●	●	
	S			●					●																											
	J			●				●						●		●	●			●	●				●	●			●				●	●	●	●
	L				●	●			●				●			●		●	●									●								
	E			●					●			●															●									
Cobia *Rachycentron canadum*	A				●				●	●	●			●		●					●			●							●		●		●	
	S				●				●																											
	J				●			●	●	●	●			●		●			●		●		●	●						●			●		●	
	L					●			●				●			●			●									●								
	E					●			●			●															●									
Gray snapper *Lutjanus griseus*	A			●			●	●	●	●				●		●					●			●		●					●		●	●	●	
	S			●					●																											
	J			●			●	●	●	●				●		●					●		●	●		●				●			●	●	●	
	L					●			●				●			●			●									●								
	E			●					●			●															●									
Red drum *Sciaenops ocellatus*	A				●				●					●		●					●			●	●	●						●	●	●	●	●
	S				●																															
	J				●	●		●	●					●		●					●		●	●	●	●				●			●	●	●	
	L					●			●				●			●			●									●								
	E					●			●			●															●									
Spanish mackerel *Scomberomorus maculatus*	A				●				●	●	●			●		●					●			●							●		●	●	●	●
	S				●				●																											
	J				●			●	●	●	●			●		●					●									●						●
	L					●			●				●			●			●		●		●					●								
	E					●			●			●																●								

Source: NOAA Biogeography Program Http://biogeo.noaa.nos.gov/

Table 8 Reproductive Requirements of Selected EFH Species

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Reproduction

Species	Fertilization/ development					Mating type			Spawning strategy					Parent care		Domain		
	External	Internal	Oviparous	Ovoviviparous	Viviparous	Monogamous	Polygamous	Broadcast spawner	Andromous	Catadromous	Iteroparous	Semelparous	Batch	Protected	Non-protected	Riverine	Estuarine	Marine
Brown shrimp *Peneaus aztecus*	●		●				●				●			●				●
Pink shrimp *Peneaus duorarum*	●		●				●				●			●				●
White shrimp *Penaeus setiferus*	●		●				●				●			●			●	●
Cobia *Rachycentron canadum*	●		●				●				●		●		●			
Gray snapper *Lutjanus griseus*	●		●				●	●			●		●		●			●
Red drum *Sciaenops ocellatus*	●		●				●	●			●		●		●		●	●
Spanish mackerel *Scomberomorus maculatus*	●		●				●	●			●		●		●			●

Species	Temporal Schedule											
	January	February	March	April	May	June	July	August	September	October	November	December
Brown shrimp *Peneaus aztecus*	●	●	●	●	●	●	●	●	●	●	●	●
Pink shrimp *Peneaus duorarum*				●	●	●	●					
White shrimp *Penaeus setiferus*			●	●	●	●	●	●	●	●		
Cobia *Rachycentron canadum*					●	●	●	●				
Gray snapper *Lutjanus griseus*						●	●	●	●			
Red drum *Sciaenops ocellatus*	●							●	●	●	●	●
Spanish mackerel *Scomberomorus maculatus*				●	●	●	●	●	●	●		

Species	Periodicity				Fecundity								Maturation age					
	Annual spawning	2 or more per year	2 or more years	Undescribed	< 100	100-1,000	1,000-10,000	10,000-100,000	100,000-1 million	1-10 million	> 10 million	Undescribed	< 6 months	0.5 to 1 Year	1 to 3 Years	3 to 5 Years	> 5 Years	Undescribed
Brown shrimp *Peneaus aztecus*		●							●				●					
Pink shrimp *Peneaus duorarum*		●							●				●					
White shrimp *Penaeus setiferus*		●							●				●					
Cobia *Rachycentron canadum*		●								●					●			
Gray snapper *Lutjanus griseus*		●							●						●			
Red drum *Sciaenops ocellatus*		●								●						●		
Spanish mackerel *Scomberomorus maculatus*		●								●					●			

Source: NOAA Biogeography Program Http://biogeo.noaa.nos.gov/

3.6 Threatened and Endangered Species

3.6.1 Johnson's Seagrass

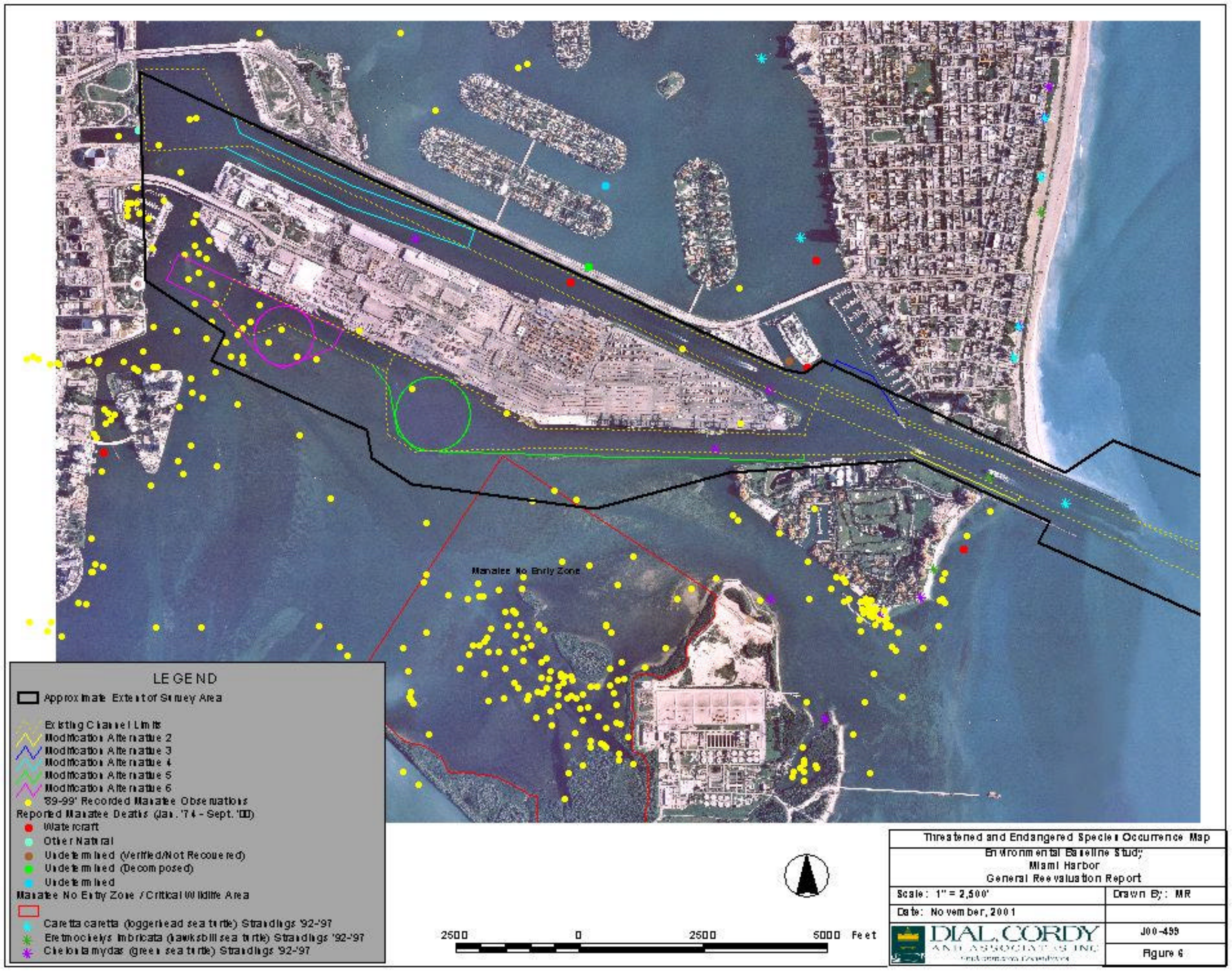
Johnson's Seagrass (*Halophila johnsonii*) was listed as a threatened species by NMFS on September 14, 1998 (63 FR 49035) and a re-proposal to designate critical habitat pursuant to Section 4 of the Endangered Species Act (ESA) was published on December 2, 1998 (64 FR 64231). The final rule for critical habitat designation for *H. johnsonii* was published April 5, 2000 (Federal Register, Vol. 65, No. 66). *H. johnsonii* has one of the most limited geographic ranges of all seagrass species. It is only known to occur between Sebastian Inlet and northern Biscayne Bay on the east coast of Florida (Kenworthy 1997). No *H. johnsonii* was observed within the study area.

3.6.2 West Indian Manatees

The West Indian manatee (*Trichechus manatus*) has been listed as a protected mammal in Florida since 1893. Federal law under the Marine Mammal Protection Act of 1972 and the Endangered Species Act as amended in 1973 protects manatees. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act designating the state as a manatee sanctuary and providing signage and speed zones in Florida's waterways.

Within Miami-Dade County there exist both permanent and transient populations of manatees. Surveys show that during the winter months when temperatures drop, manatees from north Florida and also Miami-Dade County will migrate to the Florida Power and Light (FPL) power plant at Port Everglades (USGS 2000). During the summer months when the water warms, manatees return to the counties to the north and south to forage and reproduce. Telemetry and aerial surveys (Figure 6) confirm manatees are present within Miami-Dade County all year (Miami-Dade County 1999a, USGS 2000).

Figure 6 Threatened and Endangered Species Occurrence Map



3.6.3 Sea Turtles

Miami-Dade County is within the normal nesting range of three species of sea turtles: the loggerhead (*Caretta caretta*), the green turtle (*Chelonia mydas*), and the leatherback (*Dermochelys coriacea*). The green sea turtle and leatherback turtle are both listed under the U. S. Endangered Species Act, 1973 and Chapter 370, F.S. The loggerhead turtle is listed as a threatened species. Within the 21 miles of beach within the Miami-Dade County line a total of 319 sea turtle nests were found in 1999 (Miami-Dade County 1999b). From 1980 through 2000, an average of 183 sea turtle nests were discovered on Miami-Dade County beaches. On Fishers Island a total of 24 sea turtle nests were observed during 2000. A summary of sea turtle nesting activity for Miami-Dade County is found in Table 9. The majority of sea turtle nesting activity occurred during the summer months of June, July and August, with nesting activity occurring as early as March and as late as September (Miami-Dade County 2000). The waters offshore of Miami-Dade County are also used for foraging and shelter for the three species listed above and possibly the hawksbill turtle (*Eretmochelys imbricata*) and the Kemp's ridley turtle (*Lepidochelys kempii*).

4.0 PROJECT IMPACTS

Direct impacts to seagrass, hardbottom, and reef communities from the various proposed preliminary modifications are numerically described in Table 10. One of the purposes of this document was to provide the Corps with the baseline environmental information to assist in formulating reasonable alternatives for the project. Therefore, it should be noted that the proposed modifications are preliminary in design and could change during the planning process, thereby reducing impacts to the natural resources described in this report.

Table 9 Summary of Sea Turtle Nesting for Dade County Florida, 1980-2000

Year	Number Nests	Number Hatchlings Released
1980	10	800
1981	31	2800
1982	66	6505
1983	69	6772
1984	69	6678
1985	75	7200
1986	123	14991
1987	129	10966
1988	105	10682
1989	164	13609
1990	185	16941
1991	166	14294
1992	163	15835
1993	267	20751
1994	288	25359
1995	369	27771
1996	290	23726
1997	258	18809
1998	333	22470
1999	319	26580
2000	193	-

Table 10 Direct Impact Acreages by Habitat Type

	Footprint Area (Acres)	Seagrass (Acres)	Unvegetated Bottom (Acres)	Rock Rubble w/ Algal Sponge Community (Acres)	Rock/Rubble w/ Live Bottom (Acres)	Low-Relief Hardbottom (Acres)	High Relief Reef (Acres)
Alternative 1	227.8	0	70.1	41.3	51.7	35.1	21.1
Alternative 2	5.6	0	1.7	3.9	0	0	0
Alternative 3	15.5	0.7	9.4	5.4	0	0	0
Alternative 4	56.3	0	30.1	26.2	0	0	0
Alternative 5	228.9	1.7	166.8	59.4	0	0	0
Alternative 6	78.2	22.8	55.4	0	0	0	0

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APPENDICES

APPENDIX A

Persons Consulted and Correspondence

Appendix A List of Persons Consulted and Pertinent Correspondence

Name	Affiliation	Information
Susan Markley, Ph.D.	Miami-Dade County Environmental Resource Management	Manatee Data
Craig K Grossenbacher	Miami-Dade County Environmental Resource Management	Project History
Steven M. Blair	Miami-Dade County Environmental Resource Management	Hardbottom Maps
Bill Ahern	Haulover Park	Turtle Monitoring Data
Kelly Schratwieser	FDEP	Dade County Manatee Protection Plan
Ricardo Zambrano	FFWCC	Critical Wildlife Area Bird Species List
Mike Johnson	National Marine Fisheries Service	Seagrass information
Carol Knox	Florida Fish and Wildlife Conservation Commission	Manatee Data

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSIO

BUREAU OF PROTECTED SPECIES MANAG
DAVID W. ARNOLD
(850)9
FAX (850)9

DATE:	November 7, 2000
COUNTY:	Dade
PERMIT NO.:	00-04-13-001
EXPIRATION DATE:	Nov 10, 2000

Mr. Jason Croop
Dial Cordy and Associates
115 Professional Drive, Suite 104
Ponte Vedra, Florida 32082

Re: Access to the Virginia Key No Entry Zone in Dade County

Dear Mr. Croop:

This letter shall serve as notification of the Florida Fish and Wildlife Conservation Commission's (Commission) determination in response to your November 6, 2000, request for authorization to conduct an environmental survey within a portion of the Virginia Key No Entry zone in Dade County (as designated in 68C-22.025, Florida Administrative Code (FAC)). Pursuant to 68C-22.003, FAC, the Commission is authorized to issue permits allowing the permit holder to engage in activities otherwise prohibited by Chapter 68C-22, FAC.

As stated in your request, Dial Cordy and Associates ("Dial Cordy") has been contracted by the United States Army Corps of Engineers to conduct an environmental survey of the Port of Miami area that would include mapping seagrass beds in the area of Fisherman's channel near the Virginia Key No Entry zone. This activity would involve the deployment of a snorkeler to assess seagrass abundance in the area from the channel to about 500 feet south into the No Entry zone. The activity would involve the use of a 21-foot boat with a 12" draft and would be conducted on Wednesday November 8, 2000 (or on November 9 or 10 if inclement weather prevents surveying on November 8). Based on the information provided, we have determined that limited entry into the zone should not pose a serious threat to manatees provided that Dial Cordy and Associates complies with certain conditions, as described below. Therefore a permit is hereby granted with the following conditions:

1. Access to the Virginia Key No Entry zone is authorized for Dial Cordy and Associates and their employees or authorized agents provided that entry into the zone is necessary to conduct activities associated with the environmental survey of the Port of Miami area. Movement of the vessel and snorkeling activities within the No Entry zone should be as limited as possible.

2. As requested, the permit is only valid from Wednesday, November 8, through Friday, November 10, 2000.

3. All personnel entering the No Entry zone must be informed as to the possible presence of manatees, the characteristics used to identify the presence of manatees, and the conditions of this permit.

4. At least one person must be designated as a manatee observer on the vessel. That person must have experience in manatee observation, and must be equipped with polarized sunglasses to aid in observation. (Polarized sunglasses reduce the glare created by sunlight reflecting off of the water's surface. Wearing polarized sunglasses can help boaters spot manatees, underwater obstructions, submerged aquatic vegetation, such as seagrass beds, much more clearly). The manatee observer must remain on the vessel at all times, maintain a vigilant watch, and advise all other personnel as to the presence and location of nearby manatees.

5. Only the 21' vessel and the snorkeler(s) are covered under this permit.

6. The vessel must be operated at no greater than Idle Speed while in the No Entry area and must not be anchored at any time.

7. Clearance of at least one foot (1') between vessel propellers and submerged bottom must be maintained at all times to prevent any damage to seagrasses or benthic communities. Vessel operation and monitoring activities must be performed in such a manner so as to reduce potential sediment suspension and resulting increases in ambient turbidity.

8. The vessel must be clearly marked as belonging to Dial Cordy or its authorized agent. A copy of this permit letter must be kept on board the vessel at all time while in the No Entry zone.

9. All activities, including boat movements, within the No Entry zone must be halted if manatees are observed within 100 feet of the vessel and may be resumed only after the manatee(s) have left the area on their own volition.

By copy of this letter, the Commission's Division of Law Enforcement/Bureau of Marine Enforcement, the Dade County Sheriff's Department, and the Metro-Dade Department of Environmental Resource Management are hereby advised of the nature and conditions of this permit.

This notification represents an agency determination. Please see the attached *Notice of Rights* if you wish to dispute or challenge this agency action. **FAILURE TO EXERCISE YOUR RIGHTS IN A TIMELY MANNER WILL OPERATE AS A WAIVER OF THOSE RIGHTS.** If you have any questions regarding this permit or its applicability, please contact me, Dawn Griffin or Scott Calleson of my staff at (850) 922-4330.

Sincerely,

David W Arnold

David W. Arnold, Chief
Bureau of Protected Species Management

Enclosures: *Notice of Rights*

cc (w/encl.): FWC, Office of General Counsel
FWC, DLE District 2
Dade County Sheriff's Office
Miami-Dade DERM

\\TLH-FWCC10\VOL1\RULES\Permits\Permit (Dial Cordy).doc

APPENDIX B

Seagrass Survey Data

Seagrass Survey Data

Alt 5									
Transect	**Total Quadrats**	**Occupied Quadrats**	**Sub Units**	**Occupied Sub Units**	**Sum Cover Score**	**Species**	**Frequency**	**Abundance**	**Density**
F11	5	2	80	8	1.5	HD	0.1000	0.7500	0.3000
F12	5	1	80	4	1	HD	0.0500	1.0000	0.2000
F12	5	1	80	14	3	HW	0.1750	3.0000	0.6000
F13	4	1	64	4	1	HW	0.0625	1.0000	0.2500
F15	5	3	80	42	13	HW	0.5250	4.3333	2.6000
F5	5	3	80	48	9	SF	0.6000	3.0000	1.8000
F6	4	2	64	32	7	SF	0.5000	3.5000	1.7500
F7	4	2	64	19	6	SF	0.2969	3.0000	1.5000
F8	6	4	96	52	15	SF	0.5417	3.7500	2.5000
F9	5	4	80	42	10.1	SF	0.5250	2.5250	2.0200
F10	4	1	64	16	3	SF	0.2500	3.0000	0.7500
F12	5	1	80	4	0.5	SF	0.0500	0.5000	0.1000
F14	5	2	80	27	7	SF	0.3375	3.5000	1.4000
F16	4	2	64	32	7	SF	0.5000	3.5000	1.7500
F5	5	1	80	8	4	TT	0.1000	4.0000	0.8000
F6	4	1	64	16	3	TT	0.2500	3.0000	0.7500
F7	4	1	64	16	2	TT	0.2500	2.0000	0.5000
F8	6	1	96	16	2	TT	0.1667	2.0000	0.3333
F9	5	2	80	32	7	TT	0.4000	3.5000	1.4000
F10	4	3	64	32	8	TT	0.5000	2.6667	2.0000
F12	5	2	80	20	3	TT	0.2500	1.5000	0.6000
F13	4	1	64	4	1	TT	0.0625	1.0000	0.2500
F15	5	2	80	24	6	TT	0.3000	3.0000	1.2000
F16	4	2	64	4	2.5	TT	0.0625	1.2500	0.6250
F4									
F17									
ALT 6									
Transect	**Total Quadrats**	**Occupied Quadrats**	**Sub Units**	**Occupied Sub Units**	**Sum Cover Score**	**Species**	**Frequency**	**Abundance**	**Density**
B1	6	1	96	16	4	HD	0.1667	4.0000	0.6667
B3	10	5	160	46	14	HD	0.2875	2.8000	1.4000
B4	9	5	144	50	12.5	HD	0.3472	2.5000	1.3889
B5	7	5	112	43	10.5	HD	0.3839	2.1000	1.5000
B1	6	1	96	16	4	HW	0.1667	4.0000	0.6667
B2	5	1	80	16	5	HW	0.2000	5.0000	1.0000
B3	10	2	160	32	8	HW	0.2000	4.0000	0.8000
B4	9	4	144	31	8.5	HW	0.2153	2.1250	0.9444

B5	7	1	112	2	0.5	HW	0.0179	0.5000	0.0714
B7	7	1	112	15	4	HW	0.1339	4.0000	0.5714
B3	10	1	160	1	0.1	SF	0.0063	0.1000	0.0100
B7	7	2	112	32	10	SF	0.2857	5.0000	1.4286
B2	5	2	80	24	6	TT	0.3000	3.0000	1.2000
B4	9	1	144	12	3	TT	0.0833	3.0000	0.3333
B6									
B8									
B9									
B10									
ALT 3									
Transect	**Total Quadrats**	**Occupied Quadrats**	**Sub Units**	**Occupied Sub Units**	**Sum Cover Score**	**Species**	**Frequency**	**Abundance**	**Density**
MB3	11	1	176	12	3	HD	0.0682	3.0000	0.2727
MB1	9	6	144	56	21	HW	0.3889	3.5000	2.3333
MB3	11	2	176	10	3.1	HW	0.0568	1.5500	0.2818
MB2									
MB4									
ALT 5/6									
Transect	**Total Quadrats**	**Occupied Quadrats**	**Sub Units**	**Occupied Sub Units**	**Sum Cover Score**	**Species**	**Frequency**	**Abundance**	**Density**
1A	11	4	176	48	6.5	HW	0.2727	1.6250	0.5909
2A									
3A									
4A*	7	2	112	31	4	HW	0.2768	2.0000	0.5714
Manatee zone									
Transect	**Total Quadrats**	**Occupied Quadrats**	**Sub Units**	**Occupied Sub Units**	**Sum Cover Score**	**Species**	**Frequency**	**Abundance**	**Density**
6A	8	1	128	4	0.5	HW	0.0313	0.5000	0.0625
7A	7	2	112	28	6	HW	0.2500	3.0000	0.8571
8A	9	3	144	15	2	HW	0.1042	0.6667	0.2222
6A	8	4	128	40	8.5	SF	0.3125	2.1250	1.0625
7A	7	6	112	92	23	SF	0.8214	3.8333	3.2857
8A	9	5	144	76	15	SF	0.5278	3.0000	1.6667
6A	8	2	128	22	6	TT	0.1719	3.0000	0.7500
7A	7	2	112	2	1	TT	0.0179	0.5000	0.1429
8A	9	3	144	38	8.5	TT	0.2639	2.8333	0.9444

APPENDIX C

Side Scan Survey Report

SIDE-SCAN SONAR AND VIDEO MAPPING OF FEDERAL CHANNEL, MIAMI HARBOR

8 December 2000

Prepared for:

Dial Cordy and Associates, Inc.
115 Professional Drive, Suite 104
Ponte Vedra, Florida 32082

Prepared by:

Continental Shelf Associates, Inc.
759 Parkway Street
Jupiter, Florida 33477-4567

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

Dial Cordy and Associates, Inc. contracted Continental Shelf Associates, Inc. (CSA) to perform a side-scan sonar and video survey in the vicinity of Federal Channel located at Government Cut in Miami, Florida. The survey area encompassed the entrance channel from the mouth of the inlet east to Buoy #1, and extended 600 ft north of the north edge of the channel and 600 ft south of the south edge of the channel. Water depths ranged from 20 to 50 ft. Operations were conducted aboard CSA's 23-ft survey vessel, "The Parker." CSA conducted the 2-day side-scan sonar survey on 30 and 31 August 2000. On 1 September 2000, CSA conducted towed underwater video survey operations in the subject area with one of CSA's towed video system to groundtruth the side-scan sonar data. Following the completion of field operations, CSA reviewed the side-scan sonar data, analyzed the groundtruthing information, and prepared two maps. A Survey Trackline Plot details the positions of side-scan sonar survey tracklines and towed video transects covered during the 3 days of field operations in the subject area. A Seafloor Features Map shows the distribution of hard bottom, scattered hard bottom, and sand bottom throughout the subject area.

2.0 METHODS

FIELD SURVEY EQUIPMENT AND METHODODLOGY

A total of seven 15,000-ft east-west oriented survey lines covering approximately 17.5 nautical line miles were completed during the course of this survey. Side-scan sonar data were collected throughout the survey. A Klein Model 590 side-scan sonar and a Magnavox Model 300 differential global positioning system (DGPS) receiver coupled with a Starlink Model MRB-2A beacon receiver were the primary survey instruments.

Navigation

Accurate positioning data served as the foundation for all survey data collected. The survey vessel navigation system was a Magnavox Model 300 DGPS receiver coupled with a Starlink Model MRB-2A beacon receiver. Differential corrections were acquired using the Coast Guard beacons, which broadcast real-time GPS differential corrections. The Miami Coast Guard beacon station was used during the survey. The survey was conducted using NAD 27, FL East, with the units in feet.

CSA's Navigation and Data Acquisition System (NADAS) is a modular computer software and hardware package that interfaces various data collection sensors with the DGPS positioning system. The core of the system is Coastal Oceanographics' Hypack for Windows software. The system was used during field survey operations for vessel guidance, data logging, and real-time vessel track plotting via both a primary display on the navigator's computer and a secondary display monitor placed in front of the survey vessel's helmsman. All data collected with the NADAS were initially processed and then reduced to common formats and exported to a Computer-Aided Drafting and Design (CADD) program during post-processing.

Side-Scan Sonar

A Klein Model 590 side-scan sonar was used for this survey. The sonar was deployed from a bracket mounted on the bow of the survey vessel to reduce engine and wake interference. Raw side-scan sonar data were recorded on hard copy paper scrolls as well as Digital Audio Tape (DAT) cassettes. The Klein side-scan sonar and the navigation system were interfaced, providing fix positions and vessel speed to be automatically transferred from the navigational computer to the side-scan sonar recorder. The side-scan sonar recorder printed the fix marks on the scrolls and used vessel speed to vary the paper speed to produce fully corrected records. The survey consisted of towing the side-scan sonar towfish along the series of channel-parallel (approximately east/west oriented) survey lines that were pre-plotted with a 75-m line spacing. The side-scan sonar was set to collect 500 kHz records at a slant range of 75 m to provide a swath width of 150 m, providing a 100% overlap of side-scan sonar data.

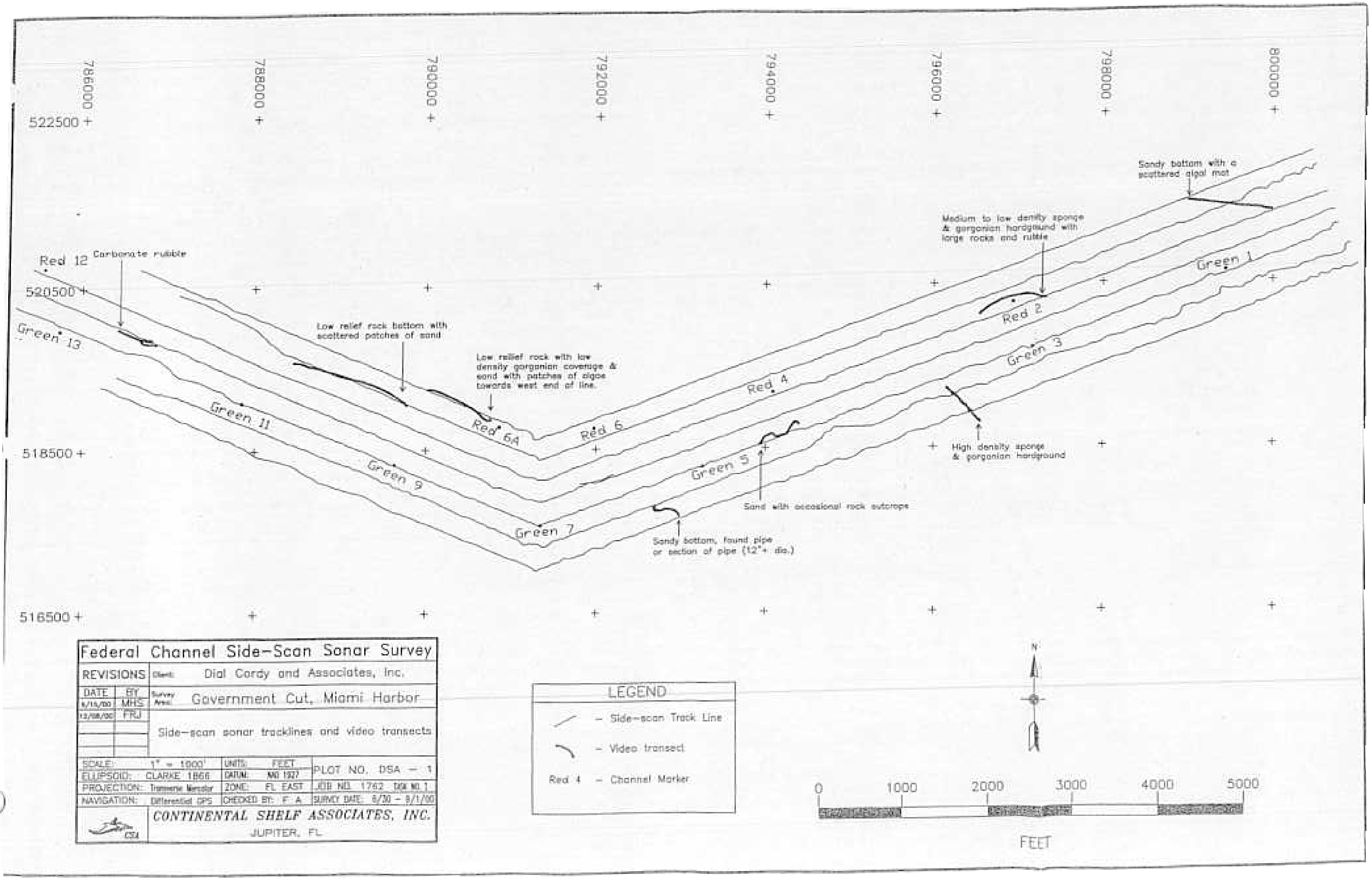
3.0 GROUNDTRUTHING OF THE SIDE-SCAN SONAR DATA

Following the side-scan sonar survey, eight areas were identified for groundtruthing with CSA's shallow water video survey system. This system is a real-time video camera platform that was interfaced with the survey vessel navigation system using a video annotator. The heart of the system is the *DeepSea* Micro-SeaCam 2000 high resolution (470 TV lines horizontal) color CCD videocamera. The Micro-SeaCam 2000 is equipped with a wide angle (95 degree diagonal in water), fixed-iris, 3.5 mm lens that automatically adjusts to varying light levels. The system also used two 250-watt *DeepSea* Multi-Lights. The camera and lights were mounted on an aluminum frame and towed and/or drifted over the eight areas of interest.

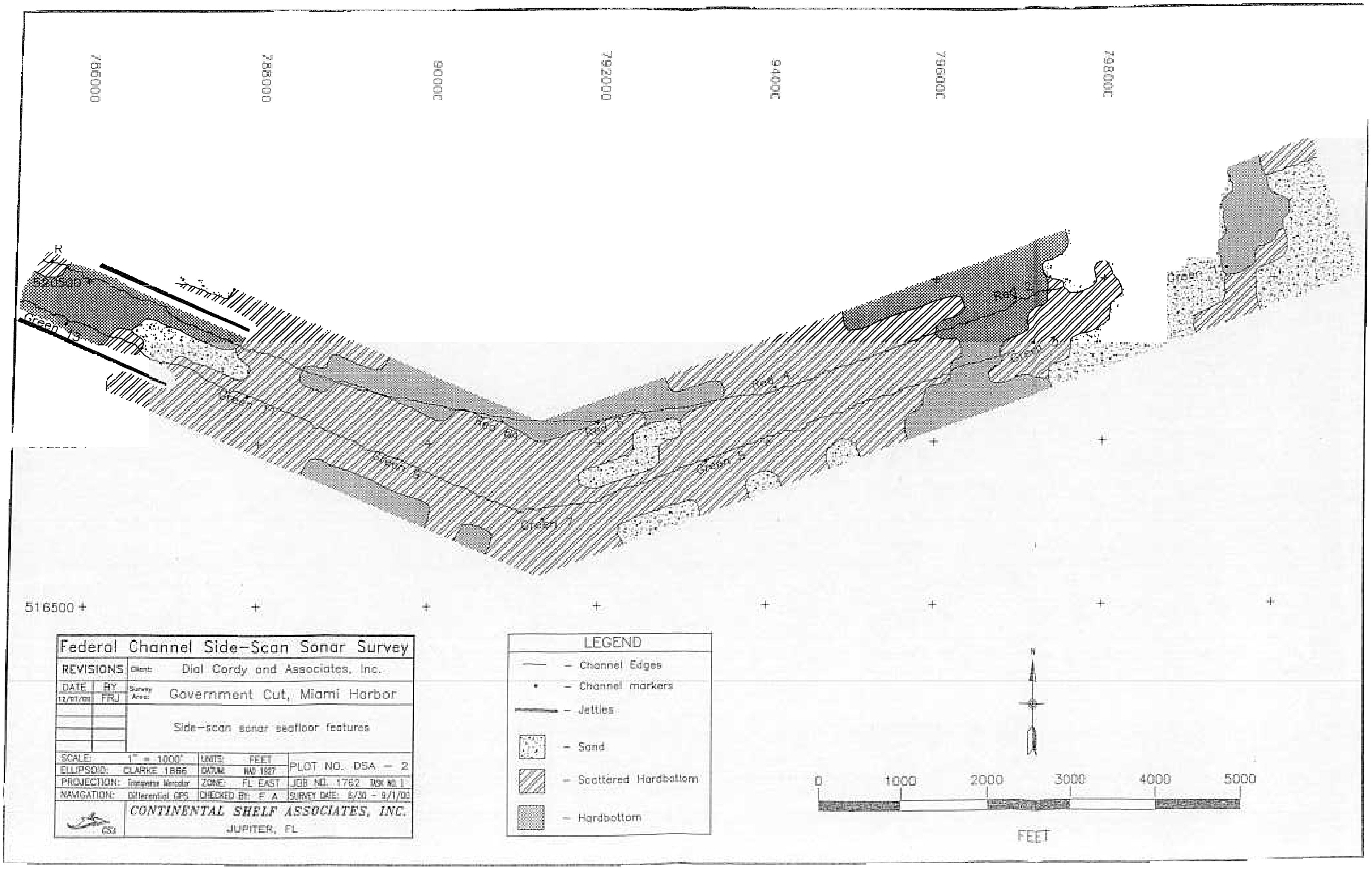
4.0 RESULTS AND DELIVERABLES

Following the completion of the surveys, the navigational data were reduced and a Survey Trackline Plot of the survey lines was completed. This trackline plot was used to display the bottom type descriptions resulting from the towed video groundtruthing. The side-scan sonar records were assessed, and the channel and hard bottom, scattered hard bottom, and sand bottom areas were digitized onto a Seafloor Features Map that overlays the Survey Trackline Plot. The final plot sheets were produced at a scale of 1 in.:1,000 ft with an X,Y coordinate overlay (in feet in the Florida State Plane Grid System). The following data are included as attachments to this final report:

A Side-scan Sonar Survey Tracklines Plot at a scale of 1in.:1,000 ft (1 sheet),
A Seafloor Features Map at a scale of 1in.:1,000 ft (1 sheet), and
One VHS videotape cassette with groundtruthing data.



786000
788000
790000
792000
794000
796000
798000
800000
522500
520500
518500
516500
Red 12
Carbonate rubble
Green 13
Green 11
Low relief rock bottom with scattered patches of sand
Low relief rock with low density gorgonian coverage & sand with patches of algae towards west end of line.
Red 6A
Green 9
Red 6
Green 7
Sandy bottom, found pipe or section of pipe (12"+ dia.)
Green 5
Sand with occasional rock outcrops
Red 4
High density sponge & gorgonian hardground
Green 3
Red 2
Medium to low density sponge & gorgonian hardground with large rocks and rubble
Green 1
Sandy bottom with a scattered algal mat
Federal Channel Side-Scan Sonar Survey
REVISIONS
Client: Dial Cordy and Associates, Inc.
DATE BY
8/15/00 MHS
12/08/00 FRJ
Survey Area: Government Cut, Miami Harbor
Side-scan sonar tracklines and video transects
SCALE: 1" = 1000'
UNITS: FEET
PLOT NO. DSA - 1
ELLIPSOID: CLARKE 1866
DATUM: NAD 1927
PROJECTION: Transverse Mercator
ZONE: FL EAST
JOB NO. 1762 TASK NO. 1
NAVIGATION: Differential GPS
CHECKED BY: F. A.
SURVEY DATE: 6/30 - 8/1/00
CSA
CONTINENTAL SHELF ASSOCIATES, INC.
JUPITER, FL
LEGEND
- Side-scan Track Line
- Video transect
Red 4 - Channel Marker
N
0
1000
2000
3000
4000
5000
FEET


786000
788000
790000
792000
794000
796000
798000
520500 +
516500 +
R
Green 13
Green 11
Green 9
Green 7
Green 5
Green 3
Green
Red 6A
Red 6
Red 4
Red 2
Federal Channel Side-Scan Sonar Survey
REVISIONS
Client: Dial Cordy and Associates, Inc.
DATE BY
12/01/00 FRJ
Survey Area: Government Cut, Miami Harbor
Side-scan sonar seafloor features
SCALE: 1" = 1000'
UNITS: FEET
PLOT NO. DSA - 2
ELLIPSOID: CLARKE 1866
DATUM: NAD 1927
PROJECTION: Transverse Mercator
ZONE: FL EAST
JOB NO. 1762
NAVIGATION: Differential GPS
CHECKED BY: F A
SURVEY DATE: 8/30 - 9/1/00
CONTINENTAL SHELF ASSOCIATES, INC.
JUPITER, FL
LEGEND
- Channel Edges
- Channel markers
- Jetties
- Sand
- Scattered Hardbottom
- Hardbottom
N
0
1000
2000
3000
4000
5000
FEET

APPENDIX D

Transect Photographs

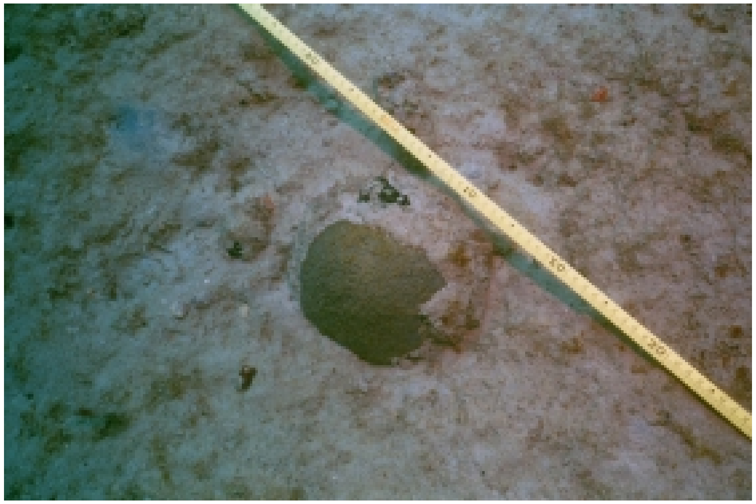


Photo 1: Star mountain coral along mid reef transect north of entrance channel.

Photo 2: Coral and algae representative of mid reef north of channel.

Photo 3: Gorgonian and sponge assemblage along mid reef tract north of entrance channel.

Photo 4: Hardbottom and octocorals along transect.

Photo 1: Coral and sponge growth representative of outer reef area.

Photo 2: Rope sponge, boring sponge and gorgonians on outer reef.

Photo 3: Representative coral, sponge and octocorals along outer reef transect.

Photo 4: Sponge and algae community along transect, outer reef.

Photo 1: Beginning of transect showing hard coral and sponge growth.

Photo 2: Transect line with representative octocoral and algae community.

Photo 3: Hardbottom area along mid reef transect.

Photo 4: Hard coral growth representative of mid reef transect.